The National Numeracy Strategy

The daily mathematics lesson

Guidance to support pupils with speech and language difficulties

Teachers and Teaching Assistants in Primary Schools
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The National Numeracy Strategy
Speech and language difficulties

The problems pupils have may include:

- difficulty producing speech and language, especially in complex words and sentences;
- difficulty understanding spoken language, especially if the speech is fast and the language is complex;
- difficulty coping with complex demands, for example writing while following spoken instructions, or counting while remembering a number;
- difficulty remembering spoken information, especially where order is important, e.g. a list of instructions, a set of numbers;
- difficulty using language in context, for example problems with listening, turn-taking, and sharing conversations.

These can result from a variety of conditions, including:

**Verbal Dyspraxia** – difficulty in planning, co-ordinating and sequencing the precise movements necessary for speech;

**Phonological Disorder** – difficulty in learning and using the rules that govern the sounds of spoken language;

**Dysarthria** – impaired ability to make the accurate movements necessary in speech production;

**Expressive Language Disorder** – difficulty learning spoken language skills, for example vocabulary and grammar;

**Receptive Language Disorder** – difficulty in understanding spoken language;

**Semantic and/or Pragmatic Disorder** – difficulty in understanding the meaning of words and phrases (semantics) and the use of language in context (pragmatics).

Speech and language difficulties for some children may arise as part of a medically-identified condition such as Landau-Kleffner Syndrome, a form of childhood epilepsy resulting in severe receptive and expressive language disorder.
How do pupils with speech and language difficulties learn mathematics differently?

Numbers and the number system

Pupils with speech and language difficulties:

- may have difficulties ordering or sequencing numbers.
  Ensure that pupils do not miss experiences of nursery rhymes and counting rhymes that involve sequencing. Pupils need opportunities to manipulate numerals physically whilst counting. Beads on a string and velcro boards with numbers on allow pupils to use, touch, move and count objects using apparatus. The use of a sliding marker on a number line to highlight the number being counted will support poor auditory sequential memory.

- may have difficulty with number vocabulary.
  It is important to focus on the structure of numbers and to develop pupils’ use of numbers beyond the teens, even if this is a ‘sticking point’. Regular counting using a 100-grid will support the development of counting skills and help to overcome such common difficulties as confusing 18 with 80.

- may find the language of number comparison difficult.
  Pupils may be able to point to a set of objects containing ‘few’ items. However, difficulties will occur when asked to select the set with ‘fewer’ or the ‘fewest’. Pupils with receptive language difficulties will often concentrate on the stem of the word – i.e. ‘few’ – and be unaware of the difference between ‘few’ and ‘fewest’. An illustration used for reference may support a simple definition.

The initial introduction of comparative language may be supported by the use of quantities that are vastly different (on sight). Regular sequenced use of few, fewer, fewest will support the understanding of this concept.
G may find it difficult to translate the spoken number into numerals. Pupils often need support in writing numbers. It is quite common to see *two hundred and sixty* written as 20060 because that is how the pupil has heard the number. Pupils with speech and language difficulties are often very rigid in their thinking. They will know how the words *two hundred* are represented in numerals and will find it hard to accept that the numerals representing *two hundred and sixty* look different from what they expect. Work with place value charts when counting will help to overcome this difficulty. Pupils will also benefit from the manipulation of place value cards to understand how numbers are built up in relation to their spoken forms.

G need to be slowly and systematically introduced to new mathematical terminology. It is important to introduce pupils to the vocabulary that is relevant to particular mathematical skills but also in line with their own personal language development. The vocabulary should be introduced on a ‘need to know’ basis. This will be structured into categories to support different aspects of mathematics: e.g. vocabulary related to the four operations; key markers; words to compare and order numbers. It is essential to support pupils in practising their own use of mathematical vocabulary and the way that vocabulary is used in the context of a mathematical topic. Where possible, new vocabulary should be introduced to pupils before they meet it in a mathematics lesson.

G may find it hard to discriminate between odd and even numbers. Outside the context of mathematics, ‘odd’ and ‘even’ mean very different things. Pupils need to have some way of grouping together odd and even numbers. A visual grouping of objects to show the difference between odd and even is possibly the most supportive.

Similarly, it can be useful to introduce a physical memory aid, such as counting in odds and evens using alternate hands and fingers. This way, the odd numbers are grouped together on one hand and even numbers on the other hand.
may learn to count in 2s, 3s, 5s, etc., by rote but cannot use information from one multiplication table to support understanding of another.

Some pupils may find it extremely difficult to learn multiplication tables, but relatively easy to learn to produce spoken responses to visual cues. Responses to cue cards may be learned first in table order, then at random.

Some pupils, however, may become competent at reciting their multiplication tables on request. This competence often masks the fact that they have learned a ‘verbal story’ with no understanding of the maths. Pupils may not be able to use the facts from the 3× table to work out the 6× table, or information from the 10× table to work out the 5× table. It is important to highlight key facts (such as 5× … is the midpoint marker in each table) when learning by rote. These can be used as ‘stepping-off points’ to check understanding and to link into other multiplication tables.

Calculations

Pupils with speech and language difficulties:

- may have short-term memory difficulties which make it difficult to hold a number or numbers in their head long enough to carry out a calculation.

For pupils with speech and language difficulties, the auditory channel is often the weakest, and so in trying to carry out mental calculations a great deal of information may be lost. Visual prompts and cues and the opportunity to manipulate physical resources, as the questions are being asked, may provide some support. This is especially the case if the questions can be written (on the board or on a piece of card) using numerals instead of words. Encourage pupils to use jottings to record numbers or to use a number line or 100-grid to locate a number.

- may have difficulty with the rapid recall of information.

Pupils who have difficulty taking in information may also have problems remembering it. They will need practice at different ways of grouping information in order to recall it. Use structured activities that the pupils may be familiar with to practise grouping, e.g. Kim’s game, dominoes and posting-box activities. Familiar activities allow pupils to focus on the mathematics. During the activity, use opportunities to question pupils about the information they are grouping. For example, when posting numbers into a box and retrieving their square numbers, stop the activity and ask which number will come next in the sequence.
may learn calculation techniques without any understanding of what is happening to the numbers.
The development of expanded methods of calculation can support all pupils’ understanding as the calculation is ‘exposed’. It is essential for pupils to have expanded methods modelled and then be encouraged to use the appropriate language to explain what is happening. Care must be taken if different approaches to calculations are adopted, as pupils with speech and language difficulties are often rigid in their thinking and cannot adapt to another method.

<table>
<thead>
<tr>
<th>20</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>800</td>
</tr>
<tr>
<td>6</td>
<td>120</td>
</tr>
</tbody>
</table>

may have visual perception difficulties that make interpretation of written calculations difficult.
Pupils may continue to need to use concrete objects to support calculations. They can often get a better understanding of a number by physically manipulating a set of objects and then experiencing the combining and partitioning of that set. For example, number bonds to 10 are best explained by using 10 objects and exploring how that 10 can be grouped in different ways. A very simple way to develop understanding is to use a coat hanger with 10 pegs on, laid out as 6 + 4; turn the coat hanger around and note that it can now ‘read’ 4 + 6. The pupils may find it useful to have a personal set of cards that provide a visual representation of the number bonds to 10.

may be able to get the correct answer to a calculation, but not be able to explain how they did it.
Pupils may need a structure through which they can share their thinking. This may be through the use of prompt cards on which they write or draw what they did, and then show in the correct sequence. Alternatively, it might be through the use of written prompt statements, which act as sentence starters to support the pupils’ verbal feedback. For example:

‘At first I …’
‘Then I added the …’
‘And next I took away the …’
‘And the answer is …’
may find it difficult to differentiate between the notation used for the different operations.

Pupils with limited processing skills may find it difficult to associate the notation for addition with the type of calculation required. Colour-coding of the calculations may be helpful, moving on to colour-coding of just the symbol, e.g. do the + in green and the × in red. This could also be colour-linked to categories of mathematics vocabulary on mini-posters.

may have difficulty understanding the language of fractions.

It is important in the initial teaching of fractions to always refer to 1 as a key marker. The language of tenths and hundredths in particular may cause problems for pupils with speech and language difficulties. This may need to be supported by visual representation of the relevant notation and then seen as a part of a whole.

may find the language of percentages difficult.

It is important to make a logical link between the ‘spoken’ percentage and the numbers represented. The use of a 100-grid will initially support the idea of a percentage as being ‘per 100’. Visual representations of percentages on a 100-square may act as markers for calculating other percentages.

Solving problems

Pupils with speech and language difficulties:

may need checklists of mathematical words and phrases to support their learning.

When a new concept is taught, it is essential to provide a structured introduction to all of the vocabulary that may be associated with that level of skill. For example, with multiplication it may be a list of words that includes: times, multiply, product, multiple, lots of. Colour-coding of groups of words may help pupils to categorise and store vocabulary efficiently.
may find word problems difficult.

It is important to ensure that the contexts of problems are always relevant and realistic. Pupils will find it easier to understand the basic problem if it is something in their own experience. If the words of the problem come from the pupil, the teacher can assume that the language level of the problem is correct. This will better ensure that the mathematics is the focus without the language difficulties getting in the way.

often find the vocabulary linked to questioning difficult.

Pupils find it hard to distinguish between questions involving why?, when?, what? and who?. It may be useful initially to link each of the question words to a symbol to prompt the correct answer; e.g. to link who? to a symbol of a person, and when? to a symbol of a clock.

often find it difficult to understand a negative when used in problems.

If you ask a pupil to pass you a number that is not an even number, they may only understand ‘even number’ and this is what you will be handed. It is important to teach the use of negatives. Simple collecting games that involve finding objects that do, and do not, meet a certain specification will help to develop these skills. For example, ‘Find me a number that is a multiple of 10. Find me a number that is not a multiple of 10.’

often have difficulty moving from oral problems to written problems.

When structuring the questions, ensure that you:

– use a common notation;
– use vocabulary that cannot be easily misinterpreted;
– use illustrations to support the question, not for decoration;
– keep the use of redundant information to a minimum;
– sequence the introduction to the required calculation in the order that it should be carried out.

It is also important to teach pupils how to use a problem-solving framework:

– read the problem;
– identify the key information;
– write key information down, draw pictures or select ‘real’ objects to support the task;
– identify question words using a highlighter pen and consider what they mean;
– decide which calculation is necessary;
– decide how to do the calculation;
– interpret the answer in the context of the problem.

If I had three 5p coins and I spent one of them, how much would I have left?

\[ 5p + 5p + -5p = 10p \]

Measures, shape and space

**Pupils with speech and language difficulties:**

- **often have difficulty with the language of time.**
  Time needs to be taught as a cycle. Visual representations of the days of the week, months of the year, and time on a clock, need to be circular. The actual information that is represented will depend on the level of ability of the pupils. Two circles may be used to represent a.m. and p.m., or just one circle to represent the 24-hour clock.

- **find it difficult to sequence events that have happened over time.**
  Use timelines to focus on the order in which events have happened. They will reinforce the use of ordinal numbers in relation to what happened first, second, third, etc. A visual timetable will also help to support aspects of time-related vocabulary. The past is a very difficult concept for some pupils with speech and language difficulties, and often the word ‘yesterday’ is used to describe the time of everything that happened before ‘today’. Pupils with specific language impairments may also try to use the present tense of a verb with a past tense ending. For example, ‘Yesterday I goed to my grandma’s house.’

- **may have problems with the range of vocabulary used to describe shape and size.**
  Many pupils will not have experienced using words such as tiny, minute, enormous, gigantic. It is therefore important, when using vocabulary to describe great differences in size, to compensate by using gesture and vocalisation. Encouraging pupils to use gesture to support their own use of size and shape words may help communication and reinforce understanding of word meanings.
It is also helpful to introduce words as opposite pairs, perhaps accompanied by appropriate objects. For example, write up these points:

- big and small
- tall and short
- wide and narrow
- long and short
- high and low

Work from the words the pupils already know – e.g. ‘big and small’ – and then make connections to new words, e.g. ‘wide and narrow’.

● may need support to use measuring equipment correctly.

The language associated with measurement can be extremely complicated. Pupils may have difficulty interpreting the information on a measuring jug or tape. Instructions about holding the tape at the end or beginning of the item to be measured can be confusing when language problems already exist. It is essential that pupils are explicitly taught a procedure that enables them to identify where to start measuring and to correctly read off the scale using a consistent unit. A set of photo-sequence cards for use of tape measures and rulers may be used to support initially.

Measuring using non-standard measures may be more difficult. If non-standard measures are being used, it is important to maintain a relevant link between the measure and the substance/object. For example, it is appropriate to measure milk in cups, but not to measure the height of the door in pencils.
Handling data

Pupils with speech and language difficulties:

- may be able to follow parts of a lesson but not make connections or form logical conclusions.

Pupils may participate in aspects of gathering data and representing data on a graph or chart, but they often cannot use the information to predict outcomes. Pupils with speech and language difficulties often have poor reasoning skills and therefore it is important that information is represented clearly.

Strategies to adopt include making large Carroll diagrams on the floor using sticky tape. Make, for example, a large square, and divide it into four boxes, two up, two down. Label the top of the first box ‘odd’ and the top of the second box ‘not odd (even)’. Label the side of the first two boxes ‘Numbers that have three tens’ and the side of the lower two boxes ‘Numbers that do not have three tens’. Pupils, holding a number, then walk from one box to another to find the right one. The teacher asks ‘Does your number have three tens?’. The pupil moves to the upper or lower of the boxes. The teacher then asks ‘Is your number odd?’. The pupil moves into the left-hand or right-hand box, so that he/she is in the right box for the number he/she is holding. Similarly, physically walking through a tree diagram or using large lego bricks on floor bar charts will support pupils’ understanding of the data-handling process.
References

Publications


Paget Gorman Signed Speech (PGSS) website: http://www.pgss.org (PGSS is a carefully conceived systematic method for manually signing spoken English. Look on the website for signs ‘big’ and ‘little’ to get an idea of how it works.)


Organisations

ACE Centre
92 Windmill Road
Headington
Oxford
OX3 7DR

Association for all Speech Impaired Children (AFASIC)
69–85 Old Street
London
EC1V 9HX

I CAN (National educational charity for children with speech and language difficulties)
4 Dyer’s Buildings
Holborn
London
EC1N 2OP

Royal College of Speech and Language therapists
7 Bath Place
Rivington Street
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EC2A 3FU

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